

R E M A R K S

This Amendment accompanying this application is being made to cancel claims 1-9 without prejudice or disclaimer of the subject matter therein and to substitute new claims 10-20 therefor, in order to avoid multiple-dependent claim fees and to place this application in proper form and condition for examination. No multiple-dependent claim fees should apply.

Therefore no multiple-dependent claim fees should be charged in this application.

The specification has also been amended for formal improvement to comply with USA practice.

An Abstract is presented on a separate page herewith.

Attached hereto is a marked-up version of the changes made to the specification by the current amendment. The attached pages are captioned "Version with marking to show changes made"

The Examiner is respectfully requested to enter this Amendment prior to calculation of the filing fee as of the national stage filing date, and to provide an action on the merits.

Respectfully submitted  
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USA PCT National Stage Patent Application  
PCT/EP00/05986 filed June 28, 2000  
Wolfgang Kauss  
VALVE ARRANGEMENT FOR CONTROLLING  
A FIRST AND SECOND HYDRAULICALLY  
ACTUATABLE DISTRIBUTING VALVE  
Priority: German Patent Application  
199 32 326.7 filed July 10, 1999

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Page 1, please replace the paragraph beginning at line 6 with the following rewritten paragraph:

FIELD AND BACKGROUND OF THE INVENTION

The invention is based on a valve arrangement which is intended for the pilot control of two hydraulically actuatable directional valves [and which comprises the features of the preamble of claim 1].

Page 2, please replace the paragraph beginning at line 6 with the following rewritten paragraph:

The pilot control pressure valves are relatively costly devices. Hence, efforts are made to reduce the number of pilot control pressure valves necessary to control two directional valves. This is possible in accordance with DE 196 30 798 A1, which presents a valve arrangement [in accordance with the preamble of claim 1],

at least if two directional valves are assigned to two hydraulic consumers, which are normally not actuated simultaneously. According to DE 196 30 798 A1, only two pilot control valves, constructed as pressure-reducing valves, are present in order to actuate the two directional valves. The control output of a pressure-reducing valve leads to a first 4/2-way directional switching valve, which in a first switching position connects the first control chamber of the first directional valve and in a second switching position connects the first control chamber of the second directional valve to the control output of the first pressure-reducing valve and discharges the respective other first control chamber to the tank. From the control output of the second pressure-reducing valve, a line leads to a second 4/2-way directional switching valve, which in a first switching position connects the second control chamber of the first directional valve to the control output and in a second switching position connects the second control chamber of the second directional valve to the control output of the pressure-reducing valve and discharges the respective other second control chamber to the tank. By comparison with valve arrangements in which a total of four pilot control pressure-reducing valves are used to control two proportionally adjustable directional valves, then, only two pilot control pressure-reducing valves are now present and two further pilot control pressure-reducing valves are replaced by much more cost-effective switching valves.

Pages 3-5, please replace the 5 consecutive paragraphs beginning at page 3, line 12 with the following rewritten paragraphs:

It is an object of the invention to design a valve arrangement, which serves for the pilot control of two proportionally actuatable directional valves [and comprises the features of the preamble of claim 1] of the above-mentioned type, in such a way that the effort needed for the pilot control of the directional valves can be further reduced and the costs associated therewith can also be further reduced.

This object is achieved with a valve arrangement [having the features of the preamble of claim 1, in that] of the above-mentioned type, wherein a second switching valve arrangement is present, via which, in a first switching position, the second control chambers of the two directional valves are jointly connected to the control output of the pilot control pressure valve and via which, in a second switching position, the second control chambers of the two directional valves are jointly relieved of pressure. The basic concept of the invention lies in the fact that the first switching valve arrangement is used not only to adjust the two directional valves in the first direction but also the first switching valve arrangement is also jointly used for the adjustment of the directional valves in the second direction. Specifically, if a directional valve is to be adjusted in the second direction, the second switching valve arrangement is brought into the first switching position in which both second control chambers of the directional valves are subjected to the action of the pressure existing at the control output of the pilot control pressure valve. Depending on which directional valve is to be actuated, the first switching valve arrangement is

brought into the first switching position or into the second switching position, in which the first control chamber of one directional valve is likewise subjected to the action of the pressure existing in the control output of the pilot control pressure valve, while the first control chamber of the other directional valve is relieved of pressure. Accordingly, only the latter directional valve is adjusted in the second direction. At the first directional valve, the forces exerted in opposite directions by the control pressure cancel out. Thus, for controlling two proportionally actuatable directional valves, only one pilot control pressure valve is now used. The other valves used are switching valves, which are relatively cost-effective.

[Advantageous embodiments of the valve arrangement according to the invention can be found in the dependent claims.]

According to features of the invention [claim 2], the first switching valve arrangement is formed by a first and a second 3/2-way directional switching valve. In this case, it is conceivable to bring both switching valves of the first switching valve arrangement into a switching position in which both the first control chamber of the first directional valve and the first control chamber of the second directional valve are subjected to the action of the pressure prevailing at the control output of the pilot control pressure valve. It is therefore possible to adjust, in each case, only one of the two directional valves, or both directional valves jointly, in the first direction. In the latter case, of course, the two directional

valves are then coupled to one another in the adjustment travel so that the corresponding hydraulic consumers are not actuated independently of one another.

According to features of the invention [claim 3], the first switching valve arrangement is preferably formed by a single directional switching valve via which, in a first switching position, the first control chamber of the first directional valve is connected to the control output of the pilot control pressure valve and the first control chamber of the second directional valve is connected to the tank, and in a second switching position the first control chamber of the second directional valve is connected to the control output of the pilot control pressure valve and the first control chamber of the first directional valve is connected to the tank. If no adjustment of the directional valve is desired, tank pressure prevails at the control output of the pilot control pressure valve. Thus, irrespective of the switching position in which the switching valve arrangements are, neither of the two directional valves is controlled. Only when a control pressure is built up by an adjustment of the pilot control pressure valve is one of the directional valves adjusted in the first or second direction, depending upon the switching position of the switching valve arrangements. With regard to the function of the second switching valve arrangement, this is preferably formed by a 3/2-way directional switching valve.

Page 6, please replace the paragraph beginning at line 19 with the following rewritten paragraph:

As already indicated, the directional valves are customarily controlled by means of a manually actuatable pilot control device which possesses a handle which can be pivoted to guide the directional valves out of a neutral position in various directions. In this case, the pilot control pressure valve is either directly mechanically adjusted or an electrical signal is generated by means of which an electrical setting member of the pilot control pressure valve is controlled. Advantageously, in accordance with features of the invention [claim 7], the first switching valve arrangement and the second switching valve arrangement are non-arbitrarily switched as a function of the pivot direction of the handle, so that the operator need not perform any additional actuation movements apart from the movement of the handle. It is conceivable here to dispose electrical switches in the pilot control device which are selectively actuated as a function of the pivot direction of the handle. In a purely electrical pilot control device, however, according to further features of the invention [claim 9], the value of the respective control signal can be used to switch the switching valve arrangements.

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Abstract

Valve arrangement for the pilot control of a first and a second  
hydraulically actuatable directional valve

A valve arrangement for pilot control of a first and second hydraulically actuatable directional valve, each of which is proportionally adjustable out of a neutral position by subjecting a first control chamber to action of a control pressure in a first direction and by subjecting a second control chamber to action of a control pressure in a second direction. The valve arrangement possesses a proportionally adjustable pilot control pressure valve with a control output at which a control pressure of different values can be set. It also possesses a switching valve arrangement via which, in a first switching position, the first control chamber of the first directional valve can be connected to the control output of the pilot control pressure valve and the first control chamber of the second directional valve can be relieved of pressure and, in a second switching position, the first control chamber of the second directional valve can be connected to the control output of the pilot control pressure valve and the first control chamber of the first directional valve can be relieved of pressure. The controlling of the directional valves is possible with little effort and cost-



effectively wherein a second switching valve arrangement is present, via which, in a first switching position, the second control chambers of the two directional valves are jointly connected to the control output of the pilot control pressure valve and via which, in a second switching position, the second control chambers of the two directional valves are jointly relieved of pressure. In order to adjust a directional valve in the second direction, the second switching valve arrangement is brought into the first switching position and the first control chamber of the directional valve to be adjusted is relieved of pressure, while the first control chamber of the directional valve not to be adjusted is subjected to the action of control pressure.